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Congenital erythropoietic porphyria: anesthetic implications

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Abstract
Congenital erythropoietic porphyria is a rare error of heme metabolism. Derangement of heme metabolism leads to disfiguration, phototoxicity, and the precipitation of porphyric crises. This case report discusses the myriad perioperative considerations in a patient with congenital erythropoietic porphyria.

Key words Erythropoietic porphyria · Phototoxicity · Pharmacology · Anesthetic implications in porphyria · Regional technique porphyria

Introduction

Porphyrias are a rare group of inborn errors of heme metabolism. These disorders can be broadly classified into neuro and cutaneous porphyrias [1]. Congenital erythropoietic porphyria (CEP) is a very rare autosomal recessive disorder characterized by deficiency of uroporphyrinogen III synthase, leading to the accumulation of porphyrins in the skin and subepidermal tissue. The exposure of such porphyrins to ultraviolet light of approximately 400 nm leads to extensive damage to the skin and subepidermal structures. This is the first case report which describes the successful use of a regional anesthetic technique in a patient with CEP, who presented for evisceration for an acutely painful blind eye. This report also summarizes the anesthetic and perioperative concerns in the management of patients with CEP.

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Case report

A 44-year-old man with an acutely painful blind right eye was admitted to the ophthalmology department of our institute. He was diagnosed as having scleromalacia perforans with endophthalmitis of the right eye. He had been diagnosed as having CEP at the age of 8 years, while being evaluated for multiple skin blisters on exposure to sunlight and the passage of red-colored urine. During investigation, he was found to have increased levels of uroporphyrinogen in urine and increased coproporphyrinogen in stool. Over a period of years he developed multiple nonhealing ulcers all over the body. He also had progressive autoamputation of the digits and persistent passage of red-colored urine. However, he had no history of abdominal pain or jaundice. Family history was noncontributory. He was scheduled for evisceration of the right eye.

Clinical examination revealed normal higher mental functions, pallor, and multiple deformities of the face and digits. The nasal bridge was deficient, revealing the nasal bones (Fig. 1); nasal alae were missing. Multiple digits on the upper and lower limbs were missing (Fig. 2). Generalized skin tightening, scarring, and ulceration were noted. He was partially edentulous with multiple loose teeth, mouth opening of $2\frac{1}{2}$ fingers, and Modified Mallampati (MMP) class 4 with restricted neck extension. Systemic examination was unremarkable with the exception of hepatosplenomegaly. Biochemical and hematological investigation results were within normal limits. Patch tests done for lidocaine and bupivacaine were negative.

During his preoperative visit intravenous access was secured with some difficulty and intravenous supplementation with dextrose-containing fluid was given overnight.

In view of the anticipated difficult airway, a regional technique supplemented with intravenous sedation was planned. A difficult airway cart was kept on standby.

Standard monitoring was attached. We encountered problems attaching the pulse oximeter, because of the mutilated digits, we circumvented the problems by repeatedly changing the site. The patient's whole body, except for the operative site, was covered with surgical drapes to prevent photosensitivity from the operation theater light.

After administering 2 μg kg^{-1} fentanyl and 2 mg midazolam, peribulbar block was given with 9 ml of 0.5% bupivacaine. Oxygen supplementation was administered through a tent. Intravenous fluid supplementation was given with 300 ml of Ringer lactate. The hour-long surgery was uneventful. The patient was alert, conscious, and pain-free at the end of the procedure. He was shifted to a dimly lit room for recovery. He was shifted to the ward following an uneventful recovery, and oral intake was allowed 2 h after the surgery. He was put on round-the-clock paracetamol and tramadol tablets for pain relief. He was discharged from the hospital on postoperative day 9.

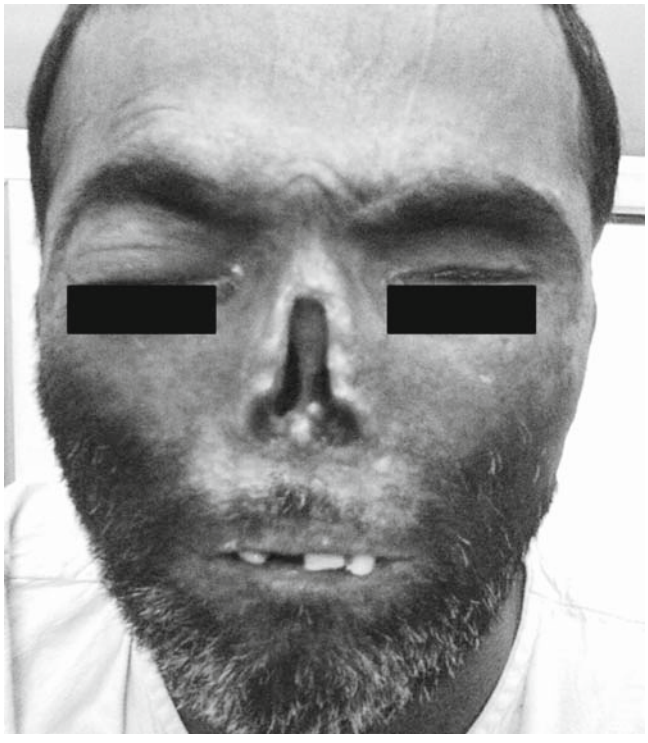

Fig. 1. Disfiguration caused by phototoxic damage

Discussion

Porphyrias are a group of enzymatic defects of heme metabolism [1]. Seven variants of porphyrias have been noted to exist. While the neuroporphyrias have elicited a considerable amount of attention in the anesthetic literature, the same does not apply to the cutaneous porphyrias. A search of the medical literature in the English language revealed a single report of a case of congenital erythropoietic porphyria (CEP) [2].

Congenital erythropoietic porphyria (CEP) is a very rare autosomal recessive disorder characterized by extreme photosensitivity to light in the wavelength range of 400 nm, eventually leading to disfiguring skin lesions, and auto-amputation of digits. Predominant urinary excretion of uroporphyrin and fecal excretion of coproporphyrin in our patient was consistent with the diagnosis of CEP. The accumulated porphyrins in skin absorb light preferentially in the ultraviolet end of the spectrum, eventually leading to lysosomal activation, subepidermal blister formation, and eventual scarring [3]. This phototoxicity and resultant scarring was responsible for the disfiguration and auto-mutilation of digits in our patient. Progressive scarring from the blisters was probably responsible for the restriction of mouth opening and neck extension, leading to the development of a potentially difficult airway. We therefore kept a difficult airway cart ready even though our primary plan was to conduct the surgery under a regional anesthesia technique. We arranged soft cloth ties for the fixation of the airway device and soft-seal face masks

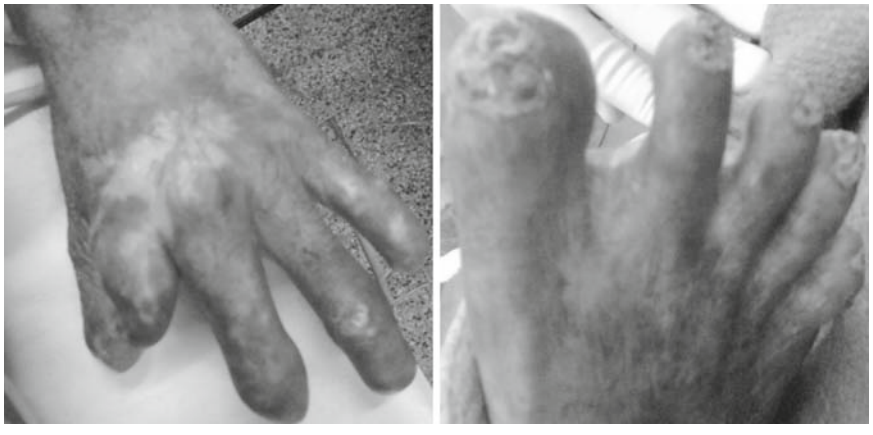

Fig. 2. Mutilation of digits in patient with congenital erythropoietic porphyria (CEP)

for ventilation in order to prevent further aggravation of the scarring and blistering of the fragile skin. Special caution was also taken during positioning and transportation.

Ceiling-mounted operating room lights in the blue range of the ultraviolet spectrum have been implicated in the development of phototoxicity, and acrylate filters have been recommended for protection [4,5]. We did not have access to such a filter; however, because the surgery was an ocular one, the entire body was thoroughly draped, so the question of exposure to the operating room lights did not arise. Postoperative recovery in a dimly lit room ensured that the patient did not suffer from phototoxic damage.

Pharmacologic concerns have been deemed to be important with regard to the management of patients with porphyrias. Drugs have been classified as safe-likely safe, unsafe-likely unsafe, and unclear with regard to their porphyrinogenic potential [6]. The Porphyria Drug Safety Database held at the University of Cape Town has modified and reviewed the drugs in common usage to reflect their desirability in such conditions [7]. We chose to restrict ourselves to the use of drugs (i.e., fentanyl, midazolam) which have been documented to be safe–likely safe. We also avoided the use of lidocaine, whose porphyrinogenic potential has been labeled as unclear. Bupivacaine was chosen because of its documented safety in porphyrias, as well as its long duration of action [5]. In the event of failure of the regional technique, we had planned to proceed with a standard general anesthetic technique with propofol and fentanyl supplemented with oxygen-nitrous oxide-halothane. Succinylcholine would have been our muscle relaxant of choice for endotracheal intubation, considering its documented safety in porphyric patients, as well as the fact that the patient presented with a potentially difficult airway. We specifically planned to avoid thiopentone, etomidate, ropivacaine, and halogenated agents other than halothane in view of the safety issues associated with their use [7].

The precipitation of acute porphyric crisis in the perioperative period was another concern in our patient. Dehydration, infection, hypoglycemia, fever, and the use of porphyrinogenic drugs have been implicated as putative causes of such crises [5,6].We prevented the triggering of such a crisis by providing perioperative fluid supplementation, avoiding the use of potential triggering drugs, and allowing oral intake soon after the surgery.

This is the first case report documenting the successful use of a regional anesthetic technique in a patient with CEP. Regional techniques, even in the setting of acute porphyria, are not considered to be an absolute contraindication, provided a detailed preoperative evaluation is made to rule out or document any existing neuropathy [6]. In the present patient the use of a regional technique, i.e., peribulbar block, which was well suited to the duration of the surgery, helped in the effective management of our patient by avoiding unnecessary manipulation of a potentially difficult airway and restricting the drug usage to a minimum number of "safe" drugs.

This case report aims to highlight the feasibility of using a regional technique in the anesthetic management of patients with CEP. The key to the successful management of such patients lies in tailoring the anesthetic technique, focusing on measures to prevent aggravation of phototoxic injury, avoiding drugs with porphyrogenic potential, and preventing the triggering of crises by avoiding the precipitating causes. Regional techniques could well emerge as a safe and effective anesthetic modality if the above concerns are kept in consideration and the patients are selected carefully.

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